

Claims

- [c1] 1. A method for making a punched headliner adapted to be installed in a motor vehicle, the method comprising: placing a flange element within a punch tool, said punch tool comprising a punching component and a mating component, said flange element placed abutting said mating component; placing a headliner blank within said punch tool, said headliner blank positioned between said punching component and said flange element; moving a punching edge towards said mating component, said punching edge positioned on said punching component; compressing said headliner blank between said punching edge and said flange element; and pressing said punching edge into contact with said flange element such that a shearing edge is formed on said headliner blank and a waste component is separated from said headliner blank.
- [c2] 2. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 1, further comprising:

bonding said flange element to an underside surface of said headliner blank.

[c3] 3. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 1, wherein said flange element comprises: an arched transition portion connecting a vertical extension to a horizontal mounting section, said horizontal mounting section pressed into communication with said headliner blank by said punching component.

[c4] 4. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 1, wherein said punching edge comprises a first angled edge, a rounded leading surface, and a second edge; said first angled edge generating shearing against said headliner blank such that said first angled edge shears said headliner blank and subsequently contacts said flange element.

[c5] 5. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 1, further comprising:
pressing said punching edge into contact with said flange element such that said shearing edge is formed with a shearing edge radius of curvature.

- [c6] 6. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 5, further comprising:
forming said shearing edge radius of curvature to tangentially mate with an arched transition portion of said flange element.
- [c7] 7. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 1, wherein said mating component includes a mating edge comprising an upper horizontal mating surface, a vertical mating engagement surface, and a rounding mating transition edge; said flange element shaped to conform to said mating edge.
- [c8] 8. A method for making a punched headliner adapted to be installed in a motor vehicle as described in claim 7, wherein said flange element includes a vertical extension section, said vertical extension section shorter than said vertical mating engagement surface.
- [c9] 9. A method for making a punched product assembly, the method comprising:
placing a flange element within a punch tool, said punch tool comprising a punching component and a mating component, said flange element placed abutting said mating component, and said mating component includ-

ing a mating edge comprising an upper horizontal mating surface, a vertical mating engagement surface, and a rounded mating transition edge;
placing a material blank within said punch tool, said material blank positioned between said punching component and said flange element;
moving a punching edge towards said mating component, said punching edge positioned on said punching component and including a first angled edge and a rounded leading surface;
compressing said material blank between said first angled edge and said flange element in the location of said rounded mating transition edge; and
pressing said punching edge into contact with said flange element such that a shearing edge is formed on said material blank and a waste component is separated from said material blank.

[c10] 10. A method for making a punched product assembly as described in claim 9, further comprising:
applying a bonding material between said flange element and an underside surface of said material blank prior to said compressing of said material blank.

[c11] 11. A method for making a punched product assembly as described in claim 9, wherein said flange element comprises:

an arched transition portion connecting a vertical extension to a horizontal mounting section, said horizontal mounting section pressed into communication with said material blank by said punching component.

- [c12] 12. A method for making a punched product assembly as described in claim 9, further comprising:
pressing said punching edge into contact with said flange element such that said shearing edge is formed with a shearing edge radius of curvature.
- [c13] 13. A method for making a punched product assembly as described in claim 12, further comprising:
forming said shearing edge radius of curvature to tangentially mate with an arched transition portion of said flange element.
- [c14] 14. A method for making a punched product assembly as described in claim 9, wherein said flange element is pre-formed to conform to said mating edge.
- [c15] 15. A method for making a punched product assembly as described in claim 9, wherein said flange element includes a vertical extension section, said vertical extension section shorter than said vertical mating engagement surface.
- [c16] 16. A method for making a punched product assembly

as described in claim 9, further comprising:
placing a secondary flange element within said punch tool prior to said compressing said material blank, said secondary flange element positioned remote from said shearing edge.

[c17] 17. A punched headliner adapted to be installed in a motor vehicle comprising:
a headliner blank element including a headliner upper surface, a headliner lower surface, and a headliner shearing edge;
a flange element including an arched transition portion connecting a vertical extension section to a horizontal mounting section, said horizontal mounting section bonded to said headliner lower surface, said headliner shearing edge positioned adjacent to said arched transition portion and forming a shearing edge radius of curvature tangentially mated with said arched transition portion.

[c18] 18. A punched headliner adapted to be installed in a motor vehicle as described in claim 17, further comprising:
at least one bonding material positioned between said horizontal mounting section and said headliner lower surface.

- [c19] 19. A punched headliner adapted to be installed in a motor vehicle as described in claim 17, wherein said headliner lower surface remains substantially planar in the proximity of said flange element.
- [c20] 20. An apparatus for manufacturing a punched product assembly, the punched product assembly including a material blank and at least one flange element, comprising:
- a punch tool comprising a punching component and a mating component, said punching component movable between an open position and a closed position, said mating component adapted to house the flange element;
 - a rounded mating transition edge formed on said mating component; and
 - a punching edge formed on said punching component, said punching edge including a first angled edge, said first angled edge pressing the material blank into the flange element at said rounded mating transition edge as said punching component moves into said closed position, said punching edge adapted to shear through the material blank, said first angled edge positioned to engage said flange element prior to said punching edge contacting said mating component.